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## **ATTACHMENTS**

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Exhibit C-1

ARIZONA DEPARTMENT OF WATER RESOURCES

HYDROLOGY DIVISION

MEMORANDUM

TO: Power Plant and Transmission Line Siting Committee

THROUGH: Greg Wallace, Chief Hydrologist  
Arizona Department of Water Resources

Dennis Sundie, Siting Committee Member

FROM: Dale Mason, Supervisor  
Groundwater Modeling Section  
Hydrology Division

DATE: November 30, 2000

RE: Hydrologic Review of PPL Sundance Energy, Certificate of Environmental  
Compatibility Application, A.C.C. Docket No. L-00000W-00-0107

Hydrology has reviewed the supplemental hydrologic report, *Water Resources Technical Report, Sundance Energy Project*, filed by PPL Sundance Energy with the Department on November 27<sup>th</sup>. The report supports PPL Sundance Energy's application for a Certificate of Environmental Compatibility.

This memo consists of two sections; the first is an analysis of recent water level and pumpage records for the area around the proposed plant site. The second section is a review of the applicant's projected plant water use and a hydrologic analysis of potential water level impacts near the plant site.

Recent Trends

1. Water Levels

The proposed plant site is located on about 300 acres of agricultural lands in Sections 1 and 2 of Township 6 South, Range 7 East, located in the Pinal Active Management Area (AMA). The proposed plant site is in an active agricultural area that contains numerous irrigation wells. Some of these wells have water level records dating back to the early 1940's.

The U.S. Geological Survey measured water levels in the AMA to support geohydrologic

investigations that were undertaken by that agency prior to the creation of the Department. The Department conducted water level sweeps of the AMA in 1988 and 1998 as part of an ongoing water level data collection program. In addition to the periodic water level sweeps, the Department measures water levels annually in selected wells throughout the State. These wells, called index wells, can be used to identify long-term changes in the water table.

Current water levels in the area around the proposed plant site are between 80 and 100 feet below land surface. There are two registered wells located on land purchased for the proposed plant site. The wells are 55-622427 and 55-622428, and neither well has a recent water level measurement. Since the mid-1980's, water levels in the area around the proposed plant site have risen by as much as 120 feet. A water level index well located one mile south of the proposed plant site has a recorded water level recovery of 115 feet since 1985.

## 2. Recent Pumpage

Groundwater pumpage for agricultural development in the Pinal AMA began in the early 1930's. The results of groundwater pumpage for irrigation is that by the mid-1980's water level declines of as much as 350 feet occurred in some areas of the AMA. Recorded water level declines in the area of the proposed plant site from 1950 to 1975 were about 130 feet.

Since 1989, Central Arizona Project (CAP) water has been available for use in the Pinal AMA. The Hohokam Irrigation District (HID) provides CAP water to lands in the area around the proposed plant site. CAP water utilization has reduced groundwater pumpage in the area around the plant site. Reported annual groundwater pumpage for the two wells associated with the land purchased for the plant has ranged from zero to 500 acre-feet from 1984 to 1999. The combined effects of reduced groundwater pumpage, application of CAP in-lieu water, and application of CAP irrigation water has led to the water level recovery that is currently being observed in area around the plant site.

## Water Level Impact Analysis

### 1. Projected Plant Water Use

The proposed plant is designed to provide peak-load electrical generation capacity and will use less water than a power plant that supplies base-load electricity. PPL Sundance estimates plant water use will average about 950 acre-feet of water per year based on 6,500 hours of operation per year. PPL Sundance is currently negotiating with the Central Arizona Water Conservation District (CAWCD) and HID for a supply CAP water for plant cooling. CAP water will be transferred through the existing HID canal system to the plant site. Groundwater will be used only as a backup source of water during interruption of CAP water supplies. Groundwater for backup cooling will be supplied by the two existing irrigation wells on the property.

## 2. Well Impact Analysis

PPL Sundance calculated potential impacts of plant pumpage on the local water table using a simple Theis drawdown analysis. Two groundwater pumpage scenarios were developed that used estimated maximum and minimum groundwater pumpage values of 190 acre-feet and 50 acre-feet per year, respectively. The Theis solution used reasonable hydrologic assumptions about local aquifer parameters and calculated drawdowns in the aquifer after 40 years of pumping.

The results of the two scenarios showed very little impact to water levels in the aquifer at the pumpage levels estimated by PPL Sundance. The maximum drawdown calculated was less than 5 feet after 40 years of plant pumpage.


### Conclusions:

The impact on local water levels by PPL Sundance power plant will be controlled by the amount of groundwater pumped for plant cooling. Using the best case scenario of full utilization of CAP water for the 40-year life of the plant, there would be virtually no impact to local water levels. The current water level recovery will continue until the aquifer comes into equilibrium with the local pumpage regime. Under a worst case scenario of withdrawing 190 acre-feet per year the impact of the plant's pumpage probably will be minimal, the current water level recovery rate may slow and the total long-term recovery of local water levels will decrease only slightly.

**ARIZONA DEPARTMENT OF WATER RESOURCES  
HYDROLOGY DIVISION**

**MEMORANDUM**

**TO:** Power Plant and Transmission Line Siting Committee

**FROM:** Greg Wallace, Chief Hydrologist  
Arizona Department of Water Resources 

**DATE:** March 15, 2001

**RE:** Supplement to the 11/30/00 Hydrologic Review of PPL Sundance Energy, Certificate of Environmental Compatibility Application, A.C.C. Docket No. L-00000W-00-0107

At the request of Jay Moyes, Attorney for Sundance Energy and Stephen Olea, the Arizona Corporation Commission Member of the Siting Committee, I have personally reviewed an additional worst case scenario which projects the potential for 950 acre feet of groundwater pumpage per year for 40 years which results in a worst case drawdown of 15.6 feet at the well. And an approximate 1-foot drawdown at ¼ mile distance from the well. The impact of such withdrawals would still be considered by ADWR to have minimal impact on the area and consistent with local management plans.

# **AQUIFER PROTECTION AND RECLAIMED WATER INDIVIDUAL PERMIT APPLICATIONS TECHNICAL REQUIREMENTS**

## **AQUIFER PROTECTION INDIVIDUAL PERMIT**

### **I. Topographic Map**

- Facility location
- Use of adjacent properties
- Known water wells within ½ mile

### **II. Facility Site Plan**

- Property lines
- Structures
- Water wells
- Injection wells
- Drywells and their uses
- Topography
- Point(s) of compliance (POC)

### **III. Facility Design Documents**

- Proposed or as-built design details and proposed or as-built configuration of basins, ponds, waste storage areas, drainage diversion features, or other engineered elements

### **IV. Proposed Facility Discharge Activities**

- Chemical, physical, and biological characteristics of the discharge
- Rate, volume, and frequency of the discharge
- Location of the discharge

### **V. Description Of The BADCT To Be Employed**

- Alternative discharge measures considered
- Evaluation of each alternative discharge control
- Technical and economic advantages and disadvantages of each alternative
- Justification for selection or rejection of each alternative

### **VI. Proposed POCs**

- Demonstration that the facility will not cause or contribute to a violation of an Aquifer Water Quality Standard (AWQS) at the applicable POC
- No additional degradation of the aquifer

## VII. Hydrogeologic Study

### A. Technical Requirements of Hydrogeologic Study

- Description of the surface and subsurface geology
- Location of surface water bodies, perennial, intermittent, or ephemeral
- Characteristics of the aquifer including depth, hydraulic conductivity, and transmissivity
- Rate, volume, and direction of surface and groundwater flow
- Location of the 100-year flood plain
- Existing water quality of the aquifer
- Known soil contamination
- Potential of the discharge to cause leaching of pollutants from surface soils
- Anticipated changes in the water quality expected because of the discharge
- Map of the facility's discharge impact area
- Criteria and methodologies used to determine the discharge impact area; or
- POC location(s)

## VIII. Contingency Plan (Must address these 5 situations)

- Violation of permit condition
- Violation of AWQS
- Alert Level is exceeded
- Discharge Limitation is exceeded
- Endangerment to public health and environment

### A. Contingency Response (Examples)

- Verification sampling
- Notification to water users
- Additional monitoring
- Inspection, testing, maintenance
- Additional hydrogeologic study
- Corrective action

## IX. Corrective Action

- Source control
- Soil clean-up
- Clean-up of surface waters
- Aquifer clean-up
- Mitigation of impact on aquifer use

X. Proposal for Monitoring, Compliance, and Closure/Post Closure Activities

- Alert levels
- Discharge limitations
- Monitoring requirements
- Compliance schedules
- Temporary cessation, closure, and post-closure strategies or plans

RECLAIMED WATER INDIVIDUAL PERMIT

I. Source Of Reclaimed Water To Be Applied For Direct Reuse

- Standard Industrial Code (SIC) classification
- Chemical, physical and biological characteristics
- Flow rate

II. Volume Generated for Direct Reuse

- Volume generated on an annual basis

III. Description of the Direct Reuse Activity

- Identify reuse activity
- Types of crops to which reclaimed water will be applied

IV. Class of Reclaimed Water to be Applied for Direct Reuse

- Determine minimum class of water quality required to support reuse activity



## SPILL PREVENTION CONTROL PLAN SUMMARY

### IDENTIFICATION OF POLLUTANTS OF CONCERN

- Prediction of direction of flow, rate of flow, and quantity of oil that could be discharged (SPCC)
- Description of potential pollutant sources, risk identification, and material inventory (SWPPP)

### COORDINATOR

- Designated person who is accountable for oil spill prevention and who reports to line management (SPCC)
- Pollution prevention planner or team under supervision of plant manager (SWPPP)

### OPERATIONAL CONTROLS

- Appropriate spill prevention and containment procedures (SPCC)
- Preventative maintenance program, good housekeeping, spill prevention and response procedures, best management practices (BMPs) (SWPPP)

### STRUCTURAL CONTROLS

- Appropriate containment and/or diversionary structures or equipment, security (SPCC)
- Sediment and erosion controls, site-specific stormwater BMPs, activity-specific BMPs, enclosure of salt storage piles (SWPPP)

### INSPECTIONS

- Testing and inspection of pollution prevention/control equipment on scheduled basis and in accordance with written procedures (SPCC)
- Routine visual inspection of designated equipment and plant areas, written procedures for follow up, and annual site inspection to verify the accuracy of pollutant source description, drainage map, and controls (SWPPP)

### EMPLOYEE TRAINING

- Owners/operators responsible for training personnel on applicable regulations and in the operation and maintenance of equipment, and should schedule and conduct spill prevention briefings for personnel (SPCC)
- Training for employees at all levels in spill response, good housekeeping, and materials management according to periodic training dates (SWPPP)

## COORDINATE WITH LOCAL AUTHORITIES

- Follow contingency plan provisions of 40CFR109 including consultation with State and local governments (SPCC)

## EMERGENCY/SPILL RESPONSE EQUIPMENT

- Appropriate container and/or diversionary structures or equipment, or, a written commitment of equipment and materials required to expeditiously control and remove any harmful quantities (SPCC)
- Necessary equipment to implement a spill cleanup (SWPPP)

## NOTIFICATION/RECORD KEEPING

- Written procedures and records of inspections maintained for 3 years, and detailed notification requirements if spill event > 1000 gallons (SPCC)
- Record spills and other discharges, record stormwater quality and quantity, document inspection and maintenance activities (SWPPP)

## EVACUATION PROCEDURES

## PLAN LOCATION/DISTRIBUTION

- Maintain at facility if attended at least 8 hours per day, or at nearest field office (SPCC)
- Maintain at facility (SWPPP)

## MODIFICATION OF PLAN

- By the owner/operator if changes to facility, or if warranted by findings of 3 year evaluation (SPCC)
- If plan fails to control pollutants in stormwater, or if there is a change in design, construction, operation, and maintenance, or if requested by director (SWPPP)

## CERTIFICATION

- Plan must be reviewed and certified by a professional engineer (SPCC)
- Signed and certified in accordance with 40 CFR 122.22 (SWPPP)

### References

Memphis State University. 1971. Effects of noise on wildlife and other animals. NTID300.5, U.S. Environmental Protection Agency, Washington, D.C. 74p.

study program, which will be administered by a group of federal agencies, will concentrate research efforts and accelerate results. SRP will continue to support this effort.

**S**alt River Project has also contributed to medical research conducted by the Department of Energy. SRP will continue its contributions to the medical research of EMF and biological effects.

### **SRP's COMMITMENT TO COMMUNICATING ABOUT EMF**

**B**ecause electric and magnetic fields exist all around us, exposures cannot be controlled simply by managing fields given off from power facilities. Studies show that primary sources of EMF exposure for most people are inside the home and workplace. This is largely the case because we are closer to those kinds of sources than we are to power facilities. For most customers in SRP's service territory, the greatest opportunity for managing exposures to EMF belongs to the customers themselves. For those customers, measures such as sitting several feet away from a television set, moving an electric alarm clock an arm's length away, and moving away from a microwave oven while it's operating, can provide greater overall exposure reduction.

**S**RP has gathered much information about EMF. Information about the status of medical research, field management techniques, and exposure reduction opportunities is available for all of SRP's customers and employees.

**T**he Salt River Project is committed to openly sharing EMF knowledge so that customers and employees can make informed decisions about prudent field management. SRP's information exchange program includes:

1. Training of SRP staff and representatives to respond to customer questions concerning EMF. Customer information exchange takes place by correspondence, telephone, and in-person visits.
2. Employee information exchange, through informational mailings, newsletter articles, and in-house presentations.
3. The EMF Speakers Bureau - a group of SRP employees trained with a thorough knowledge of EMF issues and medical research status. These volunteer employees are available for community presentations upon request.
4. EMF measurements are made upon request, at no charge to SRP customers and community members living near SRP power facilities. Qualified\* individual residential, commercial, and industrial customers are eligible for this service.

*\* The current property owner must request the measurement. For other requirements of qualification, contact the Customer Information Center at 236-8888.*

**T**he Salt River Project is committed to communicating to customers and employees about EMF, and will continue to make our knowledge available. We encourage our customers and employees to learn all they can about EMF, and make prudent decisions about exposures and field management.

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## **ELECTRIC & MAGNETIC FIELDS SALT RIVER PROJECT'S POSITION**

April 1992

*The Salt River Project recognizes and shares the concerns of its customers and employees about the possible association between Electric and Magnetic Fields (EMF) and health effects. The present state of EMF medical research remains clouded with inconsistent results. Is there conclusive evidence that EMF exposures can be associated with health effects? What EMF exposure level is safe or harmful? Which attribute of electric or magnetic fields, or both is of concern?*

### **NO EASY ANSWER**

**T**he answers to these questions are not yet clear. The statistical public health studies, or epidemiological studies, that have been conducted so far have yielded mixed results. As many studies have shown no association between EMF and health effects as those that have shown positive associations. An equally large group of studies have shown no conclusive results at all. The biological studies of EMF have attempted to determine whether a cause and effect relationship exists between exposures and health effects. These studies have also yielded inconclusive and inconsistent results.

## WHAT WE'RE DOING

**A**lthough medical research results have not been conclusive, the possibility of an association between EMF and health effects remains an important question that must be answered. Salt River Project has supported and funded EMF medical research and will continue to pursue answers to EMF questions. SRP is actively conducting research and investigating prudent methods of modifying the design and location of our transmission, distribution and substation facilities. Additionally, Salt River Project is committed to sharing and communicating information about EMF with our customers and employees so that they are able to make prudent decisions about managing their own exposures.

## PRUDENT FIELD MANAGEMENT

**T**here is no place where electric and magnetic fields do not exist. Electromagnetic waves that are used for communication signals produce fields throughout the earth's atmosphere, indoors and outdoors. The earth's molten core produces a very strong magnetic field that exists all over the globe. And every electrical device in our modern lives, such as appliances, computers, and power facilities, produces electric and magnetic fields.

**B**ecause medical research has not been able to determine whether EMF is safe or hazardous or which attribute(s) of a field might be related to biological effects, no one knows whether it is beneficial to limit human exposures to strong fields or weak fields. Magnetic field strength (measured in units of milliGauss, or mG) is one of many measurable

attributes of EMF and has been the focus of most of the epidemiological research. Fields can also be measured by wave shape, duration, frequency, and many other parameters. But no consistent correlation appears between particular measures of milliGauss and biological effects, and researchers acknowledge that field strength may not be the proper measure of EMF exposure.

**I**n the absence of knowledge that reducing or increasing field strengths will produce a health benefit, the Salt River Project believes that "field management" is a prudent approach. Prudent Field Management suggests that as long as the possibility exists that some aspect of a field may be related to health effects, prudent steps should be taken to manage the field regions around sources of electric and magnetic fields wherever possible.

SRP is committed to exploring ways of managing fields from electric power facilities by:

1. Incorporating "EMF Sensitivity" into the processes of siting new power lines and substation facilities, and the property management of existing Rights of Way and easements. SRP will examine options for siting facilities in areas least affected by EMF exposures, avoiding schools, daycare centers, hospitals, and other public facilities wherever practical. While multiple options for siting do not always exist, preference will be given to siting away from these types of facilities wherever the option is feasible.
2. Engineering options to manage fields in areas where people may be

exposed. Studies are underway to determine the practical merits of taller transmission and distribution structures, arrangements of conductors, and management of power flows within the electric system to reduce the field regions around power facilities. SRP is committed to continuing this type of research and will implement options that are technically and economically sound, and prudent.

## SUPPORT OF MEDICAL RESEARCH

**T**he electric utility industry is responsible for the vast majority of medical research of EMF and health effects undertaken so far. Much of the epidemiological and biological research has been sponsored by the Electric Power Research Institute (EPRI). Through contributions to EPRI, Salt River Project has helped to support EPRI's EMF Research Program. EPRI's budget for EMF research last year was approximately eight million dollars and is expected to increase this year. Many of the most noted contributions to epidemiological research have come from EPRI programs. Examples include the University of Southern California study conducted by Dr. John Peters, and the study conducted by Dr. David Savitz of the University of North Carolina.

**T**hrough participation in the Large Public Power Council, SRP has also helped to develop a national EMF research strategy. The national program would be supported by both private and federal funds and would focus on both medical research and public information dissemination. The national